

Luka Nedimović

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Education

Faculty of Sciences, University of Novi Sad – Information Technologies, BS (GPA: 10.00)	2023 – present
Faculty of Computing, Union University – Computer Science, BS (Scholarship) (GPA: 9.3)	2023 – present

Industry Experience

Quantastica | Machine Learning Engineer (Volunteer) | Python, PyTorch, Qiskit, Distributed Training
November 2025 – (Ongoing)

- Developing and experimenting with diverse deep learning architectures, including CNNs, Transformers, GNNs, and Diffusion models for quantum circuit optimization
- Building scalable distributed training pipelines in cloud environments for training high-qubit quantum circuit models, on modern CUDA GPUs

Smartocto | Machine Learning Engineer | Python, PyTorch, Flower, AWS July 2024 – November 2024

- Engineered **distributed training workflows** for federated language models, implementing robust client-server synchronization and reproducible experiments with Flower + BERT.
- Built a scalable **AWS ETL pipeline** (EC2, VPC, S3, IAM, Lambda) for cleaning and processing **30k+ articles**, enabling high-throughput data ingestion and transformation.
- Designed modular APIs and configurable pipelines that shifted project scope from regression to classification, improving maintainability and accuracy.
- Contributed technical insights on system design and transformer architectures to align ML platform development with product goals.

Research Experience

Osteo GDL - Geometric DL for Osteosarcoma (Unpublished Research) | PyTorch (Geometric), Geopt
[View on GitHub](#)

- Designed and implemented three **GDL models** (GNN, SPD, Hyperbolic) for osteosarcoma classification, integrating **ResNet/ViT embeddings** with manifold learning and addressing severe class imbalance.
- Performed systematic **hyperparameter studies** analyzing effects of k , curvature C , and SPD dimensions, with results presented as a research poster.

Coalgebraic Backpropagation for Equivariant Vector Neural Networks (Unpublished Research) |
Deep Learning, Category Theory, Group Theory

- Developed a **categorical formulation of backpropagation** for VNNs by extending Mašulović's coalgebraic framework, modeling layers as E-coalgebras and passes as compositions in dual categories.
- Designed a **symmetrization operator** that projects gradients onto equivariant subspaces, with formal proof of G-equivariance preservation during training.

Personal Projects

Article GNN - Article Reads Prediction | PyTorch, PyTorch Geometric, Pandas, BERT, Git [View on GitHub](#)

- Designed a **Graph Neural Network** leveraging **BERT** for node feature extraction, significantly improving prediction quality over **BERT Regression** and **XGBoost** baselines.
- Generated publication graphs with **BERT-encoded** node features, exploiting graph locality for enhanced performance in NLP-driven tasks.
- Engaged with NLP literature on transformer-based graph representations to optimize model architecture and training.

LLM_LWR_CRAG - Flexible Code RAG Pipeline | Langchain, Huggingface, Gradio, Bash, Git [View on GitHub](#)

- Built a flexible **code RAG** pipeline for GitHub repository file retrieval, achieving **Recall@10** of **86%**, evaluated on a generated dataset using **BERT**-based embeddings.
- Implemented modular **LLM** (HF, OpenAI) and **database handlers** (ChromaDB, FAISS) with **Langchain**, enabling seamless integration of NLP models.
- Developed a user-friendly UI with **Gradio** and comprehensive documentation using **Sphinx**, informed by NLP evaluation metrics from recent literature.

(WIP) zwdx - Distributed ML Training Platform | torch.distributed, Flask, Socket.IO, Docker, Git [View on GitHub](#)

- Designed and implemented **zwdx**, an open-source framework for **distributed ML training** in PyTorch, with support for **DDP**, **FSDP**, and extensible parallelism.
- Built a Python client-server system using **Socket.IO**, **REST APIs**, and **cloudpickle** for job orchestration, optimizer reconstruction, and model state management.
- Developed real-time training progress reporting and logging pipelines, integrating with **logging**, **asyncio**, and **serialization tools** for smooth user feedback.

(WIP) zwgrad - Machine Learning Framework | Python, Numpy, CUDA (JIT), C++, Git [View on GitHub](#)

- Currently building my own machine learning framework, inspired heavily by **tinygrad**.
- Is lazy, i.e. supports **tracing**, with eventual optimizations (mainly aiming for kernel fusions).
- Will support dynamic CUDA code generation, operation unfolding (e.g. Conv2D → Unfold, Matmul, Fold) for optimization, and possibly **MLIR** integration.

Non-Industry Relevant Experience

Mediterranean ML Summer School 2025 - Participant Split, 08–12 September 2025

- Selected as one of the 300 participants (out of ~1700 applicants).
- Presented a poster on "**Geometry in Histopathology: Comparative Analysis on Graph Neural Networks and Riemannian Manifold Embeddings in Osteosarcoma Classification**".

Eastern European ML Summer School 2025 - Teaching Assistant Sarajevo, 21–26 July 2025

- Mentored participants during workshops on **Computer Vision**, **Mechanistic Interpretability**, **Reinforcement Learning**, and **Drug Discovery (Graph ML)**.
- Collaborated with **Tutorial Leads** to prepare materials for hands-on sessions.

Eastern European ML Summer School 2024 - Participant Novi Sad, 15–20 July 2024

- Participants had to submit extended abstracts that were evaluated on a competitive basis.
- I was the **only first-year undergraduate student** that was accepted.

Competitive Programming Task Author, Team Lead and IOBIH Scientific Committee Member 2023 – Present

- Creating original tasks for competitive programming olympiads in Bosnia and Herzegovina.
- Designing a competition syllabus to enrich performance on higher level competitions.

Notable Achievements

National Olympiad in Informatics (Republic of Srpska) 2017 – 2023

- **1st** place - awarded by president of Republic of Srpska for such achievement 2023

Bosnia and Herzegovina Olympiad in Informatics 2018 – 2023

- **6th** place - **Balkan Olympiad in Informatics** representative (2x) 2022, 2023
- **3rd** place - **European Junior Olympiad in Informatics** representative 2019